	<b>Approved For Release</b>	2002/07/10:	CIA-RDP67B00944R0	000100030001-4
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## RELIABILITY ESTIMATE

PROTOTYPE EQUIPMENT TYPE 1a a	and 1b
DOCUMENT NO. 449	DOC. NO. 474
November 6, 1962	TOTAL FAGES 9 COPY OF 2

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Prepared	Ву
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Approved	By

Revision Preliminary-A

Copy of copies Number of Pages 9

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## 2.0 GENERAL

In a series reliability configuration the probability of satisfactory performance of the system  $(P_s)$  is equal to the multiplication of the probabilities of each component in the system.

$$P_8 = P_1 \cdot P_2 \cdot P_3 \cdot P_4 \cdot \cdots \cdot P_n$$

The probability of satisfactory performance of a component

$$P = e^{-\lambda t}$$

where

e = Base of Natural Log

λ = Part Failure Rate

t = Operating Time

Therefore,

$$P_{s} = e^{-\lambda_{1}t} \cdot e^{-\lambda_{2}t} \cdot e^{-\lambda_{3}t} \cdot \dots \cdot e^{-\lambda_{n}t}$$

$$P_{s} = e^{-t(\lambda_{1} + \lambda_{2} + \lambda_{3} + \dots + \lambda_{n})}$$

$$\lambda_{1} + \lambda_{2} + \lambda_{3} + \dots + \lambda_{n} = \lambda_{T} \text{ (total part failure rate)}$$

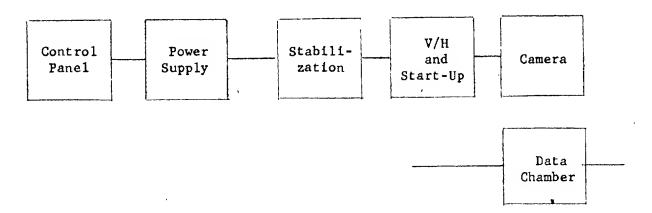
$$P_{s} = e^{-\lambda_{T}t}$$

The mean time between failure (MTBF) of a system is defined as reciprocal of the total part failure.

$$MBTF = \frac{1}{\lambda_T}$$

- 3.0 RELIABILITY ESTIMATE
- 3.1 Reliability Block Diagram

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## 3.2 Calculation of Part Failure Rate

# 3.2.1 Control Panel

Part Name
Part Failure Rate (%/1000 Hours)

Control Panel  $\frac{1.949}{1.949}$  MTBF = 51,308 Hours

3.2.2 Power Supply

Part Name Part Failure Rate (%/1000 Hours)

A.C. Power Supply .750

D.C. Power Supply  $\frac{4.355}{5.085}$  MTBF = 19,665 Hours

3.2.3 Stabilization

Part Name Part Failure Rate (%/1000 Hours)

Stabilization 50.862

Roll Weight Shifter .673

Pitch Weight Shifter .673

Cager .925 Total =53.133 MTBF = 1,882 Hours

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#### 3.2.4 <u>Camera</u>

Part Name	Part Failure Rate (%/1000 Hours)
Supply and Tension Sensor #1'.	10.340
Take-Up and Tension Sensor #3	10.340
Fwd and Aft Capstan Drives	
and Tension Sensor #2	
and Metering Roller	12.752
Fwd Slit Width and Capping Shu	tter 2.183
Aft Slit Width and Capping Shu	tter 2.183
Fwd Scanner	7.415
Aft Scanner	9.989
Fwd Shuttle	10.568
Aft Shuttle	10.676
Synchronizer.	13.005 Total = 89.451 MTBF = 1,118 Hours

# 3.2.5 V/H and Start-Up\_

No information available at this time.

## 3.2.6 Data Chamber and Timing Dots\_

Part Name	Part Failure Rate (%/1000 Hours)
Data Chamber	9.084
Timing Dots	$\frac{1.672}{10.756}$ Total = 10.756  MTBF = 9.297 Hours

## 3.3 System Mean Time Between Failure

ĺ			,	
	Control	Power	Stabili- V/	H and
	Panel	Supply		art-Up Camera
	MIBF = 51,308	MTBF = 19,665	MTBF = 1,882   MTBF	=
	$\lambda = 1.949$	$\lambda = 5.085$	$\lambda = 53.133$ $\lambda$	$= \lambda = 89.451$

MTBF is in hours.

 $\lambda$  is in %/1000 hours.

Total part failure rate = 149.618%/1000 Hours.

System MTBF = 668 Hours\*

## 3.4 Probability of Satisfactory Performance

Curve 1 gives the probability of satisfactory performance for various operating hours from 0 to 1000 hours.

• Curve 2 gives the probability of satisfactory performance for various operating hours from 0 to 100 hours.

Curve 3 gives the probability of satisfactory performance for various operating hours from 0 to 10 hours.

<sup>\*</sup>Excluding V/H and Start-Up

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